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EXAMINER	
INOA, MIDYS	

ART UNIT	PAPER NUMBER
2188	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/694,071	BOBBITT ET AL.	
	Examiner	Art Unit	
	Midys Inoa	2188	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *13 September 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-40* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-13,15-23 and 26-40* is/are rejected.

7)☒ Claim(s) *14,24 and 25* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *19 October 2000* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date: _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 31-38 are rejected under 35 U.S.C. 102(e) as being anticipated by DeKoning (6,304,942)

Regarding Claim 31, DeKoning discloses a file system, comprising a host system 102 ("client machine..."), with the ability to add additional disk drives to disk arrays ("adding a new file storage device..."). In accomplishing this, the system reconfigures the file system and distributes data across both the new disk and the previous disk ("migrating a portion of the files ...") thus, reconfiguring the file system ("new file system configuration..."). Wile this is happening, the controller continues to present the same logical volumes to the host ("not to affect file access operations..."). See Column 5, lines 40-56. Since the system is a RAID system, the disks are partitioned into data stripes ("partitioning the storage space...") where each data stripe is of the same size ("each fragment, on average, comprises..."). It is understood that the system in question can be placed in a network where the host system is remote to the Storage Arrays (See Figure 3). The storage devices in the storage arrays are accessed via enterprise storage controller 310 (file system protocol) and the abstraction layer provided is made of storage controller 310 and ELB RAID Controller 306 **which are known to run software modules since**

they are hardware components that are driven via software instructions and which present the file system as a virtual file system. Presentation as a virtual file system takes place when the RAID controller continues to present the same number of logical volumes to the host even when additional volumes have been added (column 5, lines 40-56). The abstraction layer is informed of new file system configuration when the enterprise storage controllers read metadata to reconstruct the logical mapping ("mapping data...") of data and volumes (Column 6, line 57 – Column 7, line 17).

Regarding Claims 32-37, DeKnoning discloses accessing the storage device in the storage arrays via enterprise storage controller 310 (file system protocol) and providing an abstraction layer (storage controller 310 and ELB RAID Controller 306), which presents the file system as a virtual file system. Presentation as a virtual file system takes place when the RAID controllers (agent modules) continue to present the same number of logical volumes to the host even when additional volumes have been added (column 40-56). The abstraction layer is informed of new file system configuration when the enterprise storage controllers (filter driver, daemon) read metadata to reconstruct the logical mapping (master directory) of data and volumes (Column 6, line 57 – Column 7, line 17). Since the RAID controllers are in communication with the enterprise storage controllers, appropriate mapping information is maintained. Additionally, the mapping information allows for the maintenance of the relation between virtual directories and physical directories ("links virtual directory ...", "name comprising indicia that identifies the location of the physical directory..."). It is understood that the system in question can be placed in a network where the host system is remote to the Storage

Arrays (See Figure 3) and in such case; the network would be implemented via an Internet file system protocol such as TCPIP.

Regarding Claim 38, DeKoning discloses a file system with the ability to add additional disk drives to disk arrays. In accomplishing this, the system reconfigures the file system and distributes data across both the new disk and the previous disk ("migrating to the new storage ...") thus, automatically reconfiguring the file system ("automatically selecting..."). The system functions by employing a feature called Dynamic Capacity Expansion ("administrative tool..."). See Column 5, lines 40-56. Since the system is a RAID system, the disks are partitioned into data stripes (RAID striping). It is understood that the system in question can be placed in a network where the host system is remote to the Storage Arrays (See Figure 3).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1-6, 13, 16-22, and 31-37 are rejected under 35 U.S.C. 103(a) as being unpatentable over DeKoning (6,304,942) in view of Nagasawa et al. (2001/0000818 A1)

Regarding Claims 1 and 22, DeKoning discloses a file system with the ability to add additional disk drives to disk arrays ("adding a new file storage device..."). In accomplishing this, the system reconfigures the file system and distributes data across both the new disk and the previous disk ("migrating a portion of the files ...") thus, reconfiguring the file system ("new file

system configuration..."). Although data migration has occurred, the controller continues to present the same logical volumes to the host ("not to affect file access operations..."). See Column 5, lines 40-56. Since the system is a RAID system, the disks are partitioned into data stripes ("partitioning the storage space...") where each data stripe is of the same size ("each fragment, on average, comprises..."). It is understood that the system in question can be placed in a network where the host system is remote to the Storage Arrays (See Figure 3). Although DeKoning teaches that data migration does not affect future data accesses, it does not teach hiding the data migration from the client application during data migration. **Nagasawa et al. discloses a number of methods under which accesses from the CPU can be relialized during data migration without any effect on the system (see Page 1, paragraphs 0004-0008).** It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the migration system of DeKoning to include the allowance of accesses during data migration as done by Nagasawa since doing so would allow for a more effective system since data accesses do not need to be delayed while migration is occurring.

Regarding Claim 2, DeKoning discloses distributing data evenly across all storage disks. Since all disks are of the same capacity, evenly distributing the data allows the system to have evenly distributed unused capacity (Column 5, lines 40-56).

Regarding Claim 3, 19, DeKnoning discloses accessing the storage device in the storage arrays via enterprise storage controller 310 (file system protocol) and providing an abstraction layer (storage controller 310 and ELB RAID Controller 306), which presents the file system as a virtual file system. Presentation as a virtual file system takes place when the RAID controller

continues to present the same number of logical volumes to the host even when additional volumes have been added (column 40-56).

Regarding Claims 4 and 20-21, the abstraction layer is informed of new file system configuration when the enterprise storage controllers read metadata to reconstruct the logical mapping ("master directory...", "fragment map...") of data and volumes (Column 6, line 57 – Column 7, line 17). The directory maintains the relationship between the virtual data location ("virtual directory...") known to the host and the remapped location after reconfiguration ("location on the file system... physically stored")

Regarding Claim 5, the storage abstraction layer distributes all files across all of the storage devices in the file system so as to load balance access operations of the flies (Striping) after reading the metadata of each storage disk (Column 7, lines 7-17).

Regarding Claim 6, in reconstruction the logical mapping of data and volumes through the use of disk metadata, the enterprise storage controller is enabling the re-mapping of access requests from the host. Since the controller presents the same logical volumes to the host (Column 5, lines 40-46) even after reconfiguration, the re-mapping data is used to convert the host's accesses to match the new data distribution (Column 7, lines 7-17 and 32-40).

Regarding Claim 13, Dekoninig discloses partitioning the storage space in stripes (RAID striping) and assigning the files to particular stripes as they are evenly redistributed and reconfigured.

Regarding Claims 16-17, in reconfiguring the RAID Arrays, the stripes of data are redistributed amongst all storage disks including the new disk added to the storage array (selecting fragments to be migrated). Since the stripes (fragments) are redistributed evenly, not

all the stripes are being migrated since some stripes will remain in their corresponding disk (Column 7, lines 7-17, "reconfigures data...distribute it evenly").

Regarding Claim 18, DeKoning discloses a file system with the ability to add additional disk drives to disk arrays. In accomplishing this, the system reconfigures the file system and distributes data across both the new disk and the previous disk ("migrating to the new storage ...") thus, automatically reconfiguring the file system ("automatically selecting..."). The system functions by employing a feature called Dynamic Capacity Expansion ("administrative tool..."). See Column 5, lines 40-56. Since the system is a RAID system, the disks are partitioned into data stripes (RAID striping). It is understood that the system in question can be placed in a network where the host system is remote to the Storage Arrays (See Figure 3).

Regarding Claims 26-30, DeKnoning discloses accessing the storage device in the storage arrays via enterprise storage controller 310 (file system protocol) and providing an abstraction layer (storage controller 310 and ELB RAID Controller 306), which presents the file system as a virtual file system. Presentation as a virtual file system takes place when the RAID controllers (agent modules) continue to present the same number of logical volumes to the host even when additional volumes have been added (column 40-56). The abstraction layer is informed of new file system configuration when the enterprise storage controllers (filter driver, daemon) read metadata to reconstruct the logical mapping (master directory) of data and volumes (Column 6, line 57 – Column 7, line 17). Since the RAID controllers are in communication with the enterprise storage controllers, appropriate mapping information is maintained. Additionally, the mapping information allows for the maintenance of the relation between virtual directories and physical directories ("links virtual directory ...", "name

comprising indicia that identifies the location of the physical directory..."). It is understood that the system in question can be placed in a network where the host system is remote to the Storage Arrays (See Figure 3) and in such case; the network would be implemented via an Internet file system protocol such as TCPIP.

5. Claims 7-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over DeKoning (6,304,942) in view of Nagasawa et al. (2001/0000818 A1) as applied to claims 1 and 22 above and further in view of Pence (6,199, 146)

Regarding Claims 7-8, Dekoning in view of Nagasawa discloses distributing data evenly through out the newly configured, larger storage space, wherein the re-distribution process involves data migration and migrating involves identifying migration location, moving the data from the source to the migration location and re-mapping future accesses to the new data location ("identifying source... identifying destination... copying each file..."). This is accomplished through by the enterprise storage controller reconstruction of logical mappings (Column 7, lines 7-17). Dekoning in view of Nagasawa does not teach aborting the migration process if an access request is made. Pence disclose interrupting a migration process to allow a user to recall data (Column 1, lines 37-50). It would have been obvious to one of ordinary skill in the art at the time the invention was made to adapt the system of Dekoning in view of Nagasawa to interrupt the migration and reconfiguration process when an access request is made in order to allow the system to furnish requested time sensitive data. In this case, the migration process would have to be retried after the completion of the data access ("...retried at a future time").

Regarding Claims 9-10, since the migration data is being held during migration and only released in an access request situation, a lock on such data is being exercised by the migration process, which is released when the migration is interrupted by an access request. When the lock is released for the access request, the lock is held by the accessing party ("lock stolen by client application...") and the locked data is not accessible for data migration.

Regarding Claims 11-12, Pence discloses interrupting the migration process until the access request is completed. Since the accessing party is essentially being giving a lock on the access data, such a lock expires when the access is complete and so, the lock is no longer valid after such an operation is finished ("expiration time..."). When the lock is invalidated, migration may be restarted ("retried at a future time....").

6. Claims 39-40 are rejected under 35 U.S.C. 103(a) as being unpatentable over DeKoning (6,304,942) in view of Pence (6,199, 146)

Regarding Claim 39, Dekoning discloses distributing data evenly through out the newly configured, larger storage space, wherein the re-distribution process involves data migration and migrating involves identifying migration location, moving the data from the source to the migration location and re-mapping future accesses to the new data location ("identifying source... identifying destination... copying each file..."). This is accomplished through by the enterprise storage controller reconstruction of logical mappings (Column 7, lines 7-17). Dekoning does not teach aborting the migration process if an access request is made. Pence disclose interrupting a migration process to allow a user to recall data (Column 1, lines 37-50). It would have been obvious to one of ordinary skill in the art at the time the invention was made to adapt the system of Dekoning to interrupt the migration and reconfiguration process when an

access request is made in order to allow the system to furnish requested time sensitive data. In this case, the migration process would have to be retried after the completion of the data access ("...retried at a future time").

Regarding Claim 40, since the migration data is being held during migration and only released in an access request situation, a lock on such data is being exercised by the migration process, which is released when the migration is interrupted by an access request. When the lock is released for the access request, the lock is held by the accessing party ("lock stolen by client application...") and the locked data is not accessible for data migration.

7. Claims 15 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over DeKoning (6,304,942) in view of Nagasawa et al. (2001/0000818 A1) as applied to claims 1 and 22 above and further in view of Borowsky et al. (6,381,619). DeKoning in view of Nagasawa teach the invention of claims 1 and 22. DeKoning in view of Nagasawa do not teach assigning fragments of data to directories in a random manner during migration. Borowsky discloses migration in which terminal moves are made in a random order (Column 2, lines 15-20). It would have been obvious to one of ordinary skill in the art at the time the invention was made to include the random ordering of Borowsky with the system of DeKoning in view of Nagasawa since doing so would simplify the ordering function of the migration operation.

Allowable Subject Matter

8. Claims 14 and 24-25 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

9. The following is a statement of reasons for the indication of allowable subject matter:

Regarding Claims 14, and 24-25, the Prior Art of Record does not teach assigning the order of the migration of data fragments based on the directories that files currently reside in.

Response to Arguments

10. Applicant's arguments with respect to claims 1-13, 15-23, and 26-40 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Midys Inoa whose telephone number is (571) 272-4207. The examiner can normally be reached on M-F 7:00am - 4:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mano Padmanabhan can be reached on (571) 272-4210. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Midys Inoa
Examiner
Art Unit 2188

MI

Kevin L. Ellis
Primary Examiner